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AUTHOR Campbell, Dennis E.; Macey, James R.
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ABSTRACT

This paper addresses the concept of critical thinking and its utility in education and training. It is divided into three segments. First, the paper defines critical thinking by establishing what critical thinking is and is not. Second, the relationship between critical thinking and education is explored. The goal of education is reviewed, and then examples of techniques to teach critical thinking are covered. Third, the notion of critical thinking in training is examined. The analysis begins with a review of the literature regarding the term "training" and suggests the need for a broader definition. The section ends with suggestions for how critical thinking can be applied in training situations.
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CRITICAL THINKING: ITS RELATIONSHIP IN EDUCATION AND TRAINING

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This paper addresses the concept of critical thinking and its utility in education and training. The paper is divided into three segments. First, it begins with a definition of critical thinking by establishing what critical thinking is and is not. Second, the relationship between critical thinking and education is explored. The goal of education is reviewed, then examples of techniques to teach critical thinking are covered. Third, the notion of critical thinking in training is examined. The analysis begins with a review of the literature regarding the term training and suggests the need for a broader definition. The section ends with suggestions for how critical thinking can be applied in training situations.

DENNIS E. CAMPBELL, is a professor with the School of Systems and Logistics, Air Force Institute of Technology at Wright-Patterson AFB, Ohio. He teaches management subjects, such as decision-making and problem solving, in graduate and professional continuing education programs. He holds a Doctor of Philosophy degree in adult education from The Ohio State University.

JAMES R. MACEY, LtCol, USAF, is serving in an extended faculty appointment position at the Air Command and Staff College, Maxwell AFB, Alabama, as Chief of the Educational Technology Division. He holds a Doctor of Education degree in curriculum development in adult education from Auburn University.

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IN EDUCATION AND TRAINING

Dennis E. Campbell, Ph.D
Air Force Institute of Technology
School of Systems and Logistics/LSM
Wright-Patterson AFB OH 45430-6582
Tele: (513) 255-5023 (AV: 785)

James R. Macey, LtCol, USAF
Air Command and Staff College/EDT
Maxwell AFB Alabama 36112-5554
Tele: (205) 293-2603 (AV: 875)

I. INTRODUCTION

GENERAL: In recent times several authoritative concepts and techniques to improve the learning process have emerged. One of them is the notion of critical thinking. The growing acceptance of critical thinking is not one of a narrow focus of problem solving. It is much broader by including aspects such as logic, argumentation, questioning, creativity, and rationality.

Educators at all levels are likely to agree that teaching students to think is fundamental to the learning process. Lockhead and Whimbey (1987, p. 73) report that when asked to define thinking, most teachers characterize it as complex mental activity. The function of critical thinking is complex; however, its utility and place are pivotal to learning.

Educators are also likely to disagree upon the way that teaching should proceed. Just as students themselves are diverse, the methods to teach critical thinking differ in approach and application to subject or circumstance.

CRITICAL THINKING DEFINED: An exact definition of critical thinking is somewhat elusive. Rather, several terms are used synonymously. Critical thinking is commonly associated with problem solving, analytical reasoning, analysis and creative thinking. Proponents of critical thinking recognize the relationships of these terms, while those close to the topic endeavor a more precise understanding.

A refined definition is offered by Richard Paul, Director of the Center for Critical Thinking at Sonoma State University, California:

"Critical Thinking refers to a body of intellectual skills and abilities which enable one rationally to decide what to believe or do." (Paul, 1987, pp. 1-2.)

Paul distinguishes critical thinkers into more precise categories of strong sense and weak sense. A strong sense critical thinker holds himself and those with whom he agrees and disagrees to the same intellectual standards, sees truth and insight in opposing views while weakness in his own, thinks multi-logically and dialogically, strives to live within the realm of critical thinking, and use critical thinking to go beyond his interests and beliefs. An example of a strong sense critical thinker might be a clergyman or priest. One would expect clergy to follow closely the strong sense characteristics. A critical thinker in the weak sense would violate the strong sense characteristics. An example of a weak sense critical thinker might be the television movie critic who denigrates the latest films as unworthy of viewing. While in the critics' view the film might be poor, there are qualities others might find worthy and redeeming.

Ennis (1985) pointed out that a particular set of objective dispositions and analytical abilities are necessary for critical thinking. Among the dispositions are attributes of seeking a clear statement of the question, seeking reason, being well-informed, taking the total situation into account, being open-minded by withholding judgment, taking and changing positions when evidence and reason warrants. The list of abilities cited by Ennis is detailed and lengthy. In general, it includes focusing on a question, defining terms and strategies, identifying assumptions, analyzing arguments, seeking clarification or challenge, providing basic support through critical judgment, and drawing inferences. Those who do not abide by the principles are labeled as uncritical -- one who has not learned the skills associated with critical thinking, and who is naive, conforming, easily manipulated, dogmatic, closed- and narrow-minded.

Thus, critical thinking can be seen as referring to one's openness to maintain a close examination of problems and circumstances. Openness is necessary to evaluate the pros and cons of the issue or decision alternatives. It refers to a form of evaluation and judgment free of bias and interference.

BARRIERS TO CRITICAL THINKING: The afore definition suggests that becoming a truly critical thinker is difficult. There are tremendous pressures and influences that interact to affect one's evaluation and judgment. These barriers may be classified into three broad groups: Personal, organizational and societal. Though separated into three categories, the interaction among categories must necessarily be recognized.

Meyers (1987, p. 95) suggested that leading developmental theorists agree that the transformation into a critical thinkers is hindered by one's thought processes. Perry (1970) diagrammed removing the personal barriers as a flow from a dualistic position through multiplicity and relativism to commitment. This transition may be characterized as a change in values and beliefs. In the initial position one sees the issue as being divided into "either" and "or", right or wrong, good or bad. Multiplicity begins with the reckoning that uncertainty exists and it may be very real. Relativism concerns the notion that other views or contexts may be as or more acceptable. Commitment pertains to a conscious acceptance of a value along with the responsibility for the selection.

Organizational barriers are similar to one's personal constraints except that they include a collective valuation of the organization members. Norms, politics of status and position and other operating procedures are examples. Family values, religious issues, etiquette and goals of professional associations expand the array of organizations with values and beliefs that may counter others. The transformation of these opposing views flows through Perry's stages from dualism to commitment outlined above.

Societal barriers include organizational aspects, but on a larger scale. The ideologies of the USA and USSR or communists and capitalists are examples of societal barriers. Capitalists (and the USA) hold that free enterprise is a foundation for its society, while the communists (the USSR) hold that communal ownership of production and that which is produced. Societies develop various accepted norms and mores that conflict among societal sets. "Black market" is an activity the western culture finds unacceptable. Travelers to the Far East who notice this flourishing form of capitalism often label it as corruption. Their views may be classed as dualistic. Until they reason the phenomenon through multiplicity and relativistic views, the barrier continues to exist.

II. CRITICAL THINKING AND EDUCATION

GOALS OF EDUCATION: The form of education in the United States is a reflection of our values, beliefs, and priorities (Worthington, 1982, p. 1). Because of the rapid technological changes and communication channels, our society places a tremendous amount of value, resources and energy on education. Growth in the area of adult education suggests adults are particularly interested in learning immediate problems. Indeed, Knowles and Klevins (1982, p. 18) suggested we perhaps are more easily identified as a "learning society" because of change and how we manage and direct it. Blake and Mouton (1984, p. 1) warned that the increasing pace of technological change is forcing innovations for learning beyond traditional academic settings.

The fundamental goal of education includes the notion of raising skill levels of learners. The education process focuses on verbal, motor, attitudinal, intellectual and cognitive skills. Although it does not easily fit, these skill levels are addressed in that order as one proceeds through the formal education stages of kindergarten through college. That is, and in very broad terms, primary school focuses on verbal and motor skills, attitudinal skills are emphasized during middle and high school, intellectual and cognitive skills receive attention in college. Basic to all of this effort to raise skills is the notion that the learner must be better equipped to solve problems. Wigglesworth and Guelette (1982, p. 411) pointed out that educators believe the best teaching method is that of developing problem solving skills rather than teaching memorization or repetition.

WHY IS CRITICAL THINKING NECESSARY TO EDUCATION?: A leading authority on teaching improved thinking, Dr. Edward de Bono argued that thinking is a skill which can be developed and improved. de Bono pointed out that learners routinely stop thinking about an answer to a problem once a satisfactory one is found (de Bono, 1970, p. 275). He suggested our thinking skills are only half developed by overlooking better or more adequate answers. Thus, a first step to critical thinking (or in de Bono's term "lateral thinking") might be to recognize the need to think about thinking.

The relevance of de Bono's treatise may be seen when the five basic steps to problem solving are recalled. They are: (1.) Identify the problem; (2.) List the alternative solutions; (3.) Evaluate the alternatives; (4.) Select a viable solution; and (5.) Implement the selection. de Bono suggested problem solvers are likely to spend time in Step 2 necessary to develop minimum solutions to the problem. Critical

thinkers, then, are likely to not only search for additional alternatives but to define the problem in different terms or circumstances. As defined in the beginning, critical thinking includes the activities of evaluation and judgment involving the scrutiny of strengths and weaknesses of solutions. Problem solvers are quick to point out that often the biggest problem is one of defining the problem.

TECHNIQUES OF TEACHING CRITICAL THINKING: The notion of critical thinking in education is not some mystical science or cerebral phenomenon. It is not limited to courses in logic or philosophy. Rather, it is subtly basic to many accepted educational activities in science, art, business and such. Brookfield (1987, p. 138) identified critical thinking as a foundation of seven management concepts. Strategic planning, effective decision making, creative problem solving, situational leadership, entrepreneurial risk taking, research and development activities, and organizational team building, are well known concepts based on the ideas of critical thinking.

Success in teaching learners to think more critically is influenced by factors such as subject, content, process, institutional rules and politics, and learner motivation. The realities of these influences notwithstanding, certain methods and techniques seem useful. It seems basic that success hinges on two factors: learner motivation and teaching strategy.

Meyers (1986, p. 42) argued that two major barriers to learner motivation include a passive intellectual attitude and a negative preconception about academic disciplines. He suggests these barriers may be removed by beginning the learning environment by raising questions, pointing out problems in need of resolve, creating wonder, and with statements about that which is unknown. Once curiosity is aroused, learners are encouraged to raise their own questions and expand their critical thinking processes. The transfer of the direction of responsibility for learning takes on an atmosphere of self-direction. It is depicted in Perry's model of movement from dualism to commitment in relativism.

Educators have several methods and techniques available for use in establishing the basis for learner inquiry. While an veritable arsenal may be available, few educators are skillfully trained in the proper use of them. Take for example the technique of discussion. One of the benefits of discussion is that it helps students learn to think by giving them opportunities to practice thinking. Those unskilled with the technique may proceed by posing a thought or topic and soliciting participation by asking for comments. Skillful discussion leaders know that successful use of the technique rests upon

selecting a well defined topic or question. The discussion is focused toward specific and explicit learning goals. Properly conducted, discussion enables full exploration of relevant data.

Van de Ven (1974) found that task performance is less inhibited in group discussion because of increased verbal clarification and comments on ideas through the feedback process. Effective discussion would seem to improve critical thinking, while the lack of it would not. Where group discussion can not be used, the concept of thinking aloud (that is; discussing out loud with one's self) has proven successful. Here again, clarification and feedback -- even though with one's self -- proves valuable.

There is a central theme running through the techniques useful in teaching critical thinking. That theme, as we have established, surrounds the idea of problem solving and therefore lends itself to a variety of useful methods, techniques and devices. While the following examples are not all inclusive, they represent approaches available. One technique is Socratic questioning -- raising an issue for deliberation. Others include case study, puzzles, games, simulations, computer-aided instruction, syllogisms, logic, analyses, troubleshooting, field trips, observations, laboratories, and even a routine method such as lecture. The basic purpose of the technique used should be to stimulate thinking and reasoning.

It is somewhat intuitive that several techniques are available and useful in varying degrees with certain subjects. If then several techniques are available, the question of how frequently the various techniques are used seems important. Svinicki and Kraemer (1980) reported that the 12 years of schooling (which might be termed learning how to think) is the major obstacle to success in teaching critical thinking. Compounding the obstacle are teachers' reluctance to venture out from "teacher talk" and into critical thinking. Students are conditioned into expecting the teacher to tell them what is important and in effect think critically for them.

If the movement to strengthen critical thinking is to become successful, then caution must again be given that success rests upon skillful use of teaching techniques. Stonewater (1980, p. 53) identified 5 components for success in teaching critical thinking. First, he states that Piaget's description of how a learner moves from the concrete world of facts and knowledge into the world of abstraction, logic and assumption is crucial in the development of instruction for improved problem solving. Second, though mastery of a subject is the goal, self-pacing improves the changes of learning and retention. Third, methods used to achieve learning goals have an effect on the

learner and progress. Fourth, feedback on all details of the success of problem solving is absolutely necessary. Fifth, based on the adage of two heads are better than one, encourage group learning when possible and desirable -- especially by the learners.

III. CRITICAL THINKING AND TRAINING

TRAINING DEFINED: As with most other concepts in education, there is little unanimity among educators and practitioners regarding the exact meaning of that brand of teaching and learning referred to as "training." "We all speak of it as if it's a definite category and we agree on what it means. It isn't, and we don't" (Zemke, 1986, p. 18).

One possible explanation for this diversity is that little serious analysis and writing has been given to defining the concept and differentiating it from "education." An extensive ERIC search and review of Air University resources available on the subject netted three articles, a list of definitions garnered from a series of educational dictionaries, and a collection of Zen koan-like sayings dealing with the topic.

Kline's 1985 Air University Review article "Education and Training: Some Differences" analyzed each concept with respect to a variety of variables. His general conclusions were that training: emphasizes the psychomotor domain of learning; deals with learning that represents the knowledge and lower comprehension levels of Bloom's cognitive taxonomy; has its learning objective written in a criterion format; values "the right answer" arrived at by the "approved procedure"; and is capable of a definitive front end analysis. In contrast, he viewed the concept of "education" as one that: reside primarily in the cognitive domain; deals with learning at the higher cognitive levels of Bloom's taxonomy; employs objective that are more generally stated; entertains a variety of procedures and possible solutions in the quest to answer questions and solve problems; and tends toward a subjective front end analysis. This brief page and a half discussion contained no references and no bibliography.

The title of Mitchell's Educational Technology article is "Where Education Leaves Off and Training Begins." It promised more than the two and half page article delivered. It, like the Kline article, endeavored to clarify the notion of "training" by contrasting it with "education." Two of Mitchell's distinctions follow:

Training should result in some measurable, not necessarily observable, performance or behavior. Education may or may not have such an objective. Often it doesn't (p. 29).

Education has a shotgun effect -- it sends out shotgun-like information, assuming some will hit the target (some performance objective). Training has a rifled effect. It is more precise, zeroing in on its target. The glitch is, education wastes an awful lot of energy on off-target missives, and training must be done expertly or the one missive will go astray (p. 30).

Again, like the Kline article, Mitchell offered no references or bibliography.

Zemke's article in Training, "What is Technical Training Anyway?", was also brief and contains no bibliography. However, the author concentrated more on the topic of training, and he offered the views of other practitioners and academicians. He quoted Jerome J. Pelouquin, president of Performance Control Corporation, a West Chester, Pa, consulting firm, defining technical training as "teaching people how to do things and fix things. It involves psychomotor skills as opposed to cognitive skills, though cognitive skills are implied and requisite for technical training" (Zemke, 1986, p. 19). In the same article, Lynne A. Tyson, director of the technical and skills training practice are of the American Society for Training and Development, drew a distinction between technical and "soft" skills.

Technical skills are procedural, incremental, something you can learn to do step-by-step; and if the steps are accomplished correctly and in order, you can expect to have a predictable outcome. What I call soft skills are those things like decision making or problem solving, where there are so many variables that can affect the process that it would be hard to specify a procedure that would guarantee the same outcome every time (In Zemke, p. 19).

Zemke concluded with the admission that "we can't tell you with any universal authority exactly what technical training is and is not" (P. 21).

If contemporary articles cannot define the concept of training, what clarification is offered via dictionary

definitions? From the following extract, it is clear that diversity still prevails, and unanimity is lacking.

The process by which a person or animal is subjected to a kind of direction and restraint through which he learns to do specific things, to achieve the ability to do specific things, or to respond and act in certain ways when faced with particular situations (USAF Dictionary, p. 532).

[T]he special kind of teaching and instruction in which goals are clearly determined, are usually demonstrated, and call for a degree of mastery which requires student practice and teacher guidance and appraisal of the student's improved performance capabilities. . . . [I]n a derogatory sense, a process of helping others acquire skills and knowledge or comprehension (Dictionary of Education, p. 613).

There is no clear line between education and training. Some suggest differentiations can be made. "Education" deals a great deal with the acquisition of "knowledge." Training deals more with the application of knowledge. Thus, within one learning system, we can find elements of both (A Dictionary of Education, p. 273).

Frustrated by the inability to achieve directly a universal definition of what training is, many authors have resorted to an indirect approach -- the analogy. Zemke ended his article with the following: "Technical training is whatever failed to happen to the people who designed and built the carburetor and electrical system in my 1981 Dodge" (Gordon in Zemke, 1986, p.21). Mitchell offered this thought: "Place yourself in the role of a parent who just found out his/her daughter enrolled in a sex education (versus sex training) course at school" (1987, p. 29). Last, there is the old saw that draws a comparison between defining pornography and defining training, i.e., "I can't describe it in words but I sure can identify it when I see it!"

There are a number of concerns with the content of the various articles, definitions, and sayings that render them of little practical use.

First, there is little unanimous agreement with how many terms are used to describe the basic term in question --

training. For example, what Tyson referred to as "soft skills training" would probably fall into Kilne's description of "education."

Second, while there is a general impression that training deals with skills development, practitioners do not agree on their types, numbers, or categories: Perolquin talked of psychomotor skills; Tyson of technical and soft skills; and Reininger of hard, soft, and interpersonal skills (Zemke, 1986, pp. 19-20).

Third, our daily use of terms frustrates and complicates academic distinctions: we talk of "drivers' education" but refer to "teacher, medical, and counselor training." Applying the "I sure can identify it when I see it" adage, it seems that these users of "education" and "training" are reversed.

Fourth, adages and analogies offered as solutions to the definitional problem give us a false sense of security. They are aspirational in their approach; they hope to communicate a level of understanding that direct communication can not. When first heard they appear insightful, but upon closer scrutiny we find that real meaning is still elusive. The process borders on semantic alchemy.

Fifth, despite Kline's claim (p. 95) that "These differences between education and training do not suggest that one facet of learning is more important than the other, only that they are different," the two concepts are treated differentially -- in word and in deed. Education is viewed by many as a patrician pursuit, training as distinctly plebeian. Further, more than mere efficiency and homogeneous grouping of functions can be suspected for the separation of institutions such as Air University, Air Training Command, academic, and technical colleges.

Last the characteristics of training as being a psychomotor oriented, single solution, step-by-step/plug-and-chug, rote learning process is a gross oversimplification that relegates the entire concept to a lowly position unjustly and indefensibly. While there is comfort in this simplistic approach, it has negative consequences; again, it gives us a false sense of security and a degree of finality that it does not deserve. As a result, it stymies further investigation into its true and essential nature.

THE NEED FOR A BROADER DEFINITION: What is needed is a broader view of training, one that takes into account the whole

person and the intended outcome of learning. Since no definitive definition exists, we feel free to enter the fray and offer our own perception of the concept. We suggest that the two concepts "education" and "training" are not distinct entities nor are they opposite ends of a long continuum. Rather, we see the two notion as opposite sides of the same coin -- both sharing more commonalities than differences.

Many feel that education prepares students for life, but training prepare them to deal with only one segment of life. We suggest that most current definitions deal only with one small slice of that one small segment. Merely teaching answers and procedures in a learning environment is counterproductive. Most situations termed as training artificially remove all the various competing interests and factors in order to present a single bit of finite instruction. Rarely will students encounter in real life the exact situations they encountered during their learning. The complexities of life and the human mind, coupled with the explosion of information, suggest that students should be taught not only answers and procedures but ways of thinking about how to employ those answers and procedures in real life. To the degree that they are able to do so, the distinction between training and education becomes more and more negligible.

Those who persist in characterizing student learning primarily in some specific domain do so shortsightedly. Because we dedicate our efforts to psychomotor domain activities does not mean that student functioning in the remaining domains is in a suspended state of animation. Even if we are teaching a rote task, e.g., removing and cleaning a spark plug, completing a form, folding the American flag, etc., the student is still thinking, wondering, questioning, evaluating. To act as if these mental processes are not accompanying the psychomotor behavior is to have a distorted view of reality. To attend to them is to have a positive reflection on the institution and a boon to the student's learning.

CRITICAL THINKING APPLICATIONS IN TRAINING: We realize that the objective of some highly concentrated learning programs is to accelerate the student's apprenticeship and to more quickly incorporate them into the work force. However, it is our contention that time devoted to teaching and using critical thinking skills will be vindicated by the long term benefits likely to accrue to the institution that attends to them. Their avenue for application in training environments is threefold: as content; as a teaching process; as a curriculum development process.

As content, time should be devoted to teaching critical thinking skills, i.e., an open and persistent search for the

truth via systematic problem solving techniques; identification of generalizations, assumptions, conclusions, and alternatives; etc.

As a teaching process, instructors can alter their approach from the standard dissemination of information (lectures or demonstrations) to questioning techniques that stimulate student thinking about the material being learned. Few, if any, tasks are so finite that a simple demonstration and student performance is all that is required for the student to learn the material. Generating active thinking about the material at hand results in more in depth attention to the subject, as well as greater retention over time.

As a curriculum development process, critical thinking by those responsible for course development and management skills encourages greater divergent thinking about how best to present the material and create educational experiences wherein student will have a greater probability of learning the material quicker and retaining it longer. It is antidote against brain-numbing tradition and organizational apathy.

IV. SUMMARY

This paper began by investigating the definition of critical thinking. The discussion centered on the notions of rational decision-making and problem-solving. A review was made of characteristics that distinguish critical thinkers in weak and strong senses along with three barriers that prevent critical thinking. Next, the goals education were revisited and why critical thinking is important to education was addressed. Then, several techniques for teaching critical thinking were discussed. The second major portion of this paper -- the relevance of critical thinking to training -- began with an attempt to define the term "training." The need for a broader definition of training was established and the authors' view of more similarity than dissimilarity was suggested. Last and in view of the teaching techniques already outlined, three applications of critical thinking in training environments were stated.

At first, it may appear that we have suggested different approaches for incorporating critical thinking in education and training. Upon a closer view, we have not. The two concepts of education and training are just as two sides of a ruler -- one side graduated in inches; the other in centimeters. Techniques, approaches, purpose, use, and such, are much the same regardless which side is used. The distinctive difference is, of course, how you express the measurement. So it is with critical thinking in education and training. The techniques, approaches, purpose,

use, and such, for critical thinking are much the same in either category. The key is the expression of the measurement.

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KEY WORD INDEX

Critical Thinking
Teaching Problem Solving
Teaching Decision Making
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Differentiating Between Training and Education
Critical Thinking Application in Training
Critical Thinking Applications in Education